

WHAT IS CLAIMED IS:

1. An article protected by a thermal barrier coating system, comprising:  
a substrate having a substrate surface; and  
a thermal barrier coating system overlying the substrate, the thermal barrier coating system comprising  
a thermal barrier coating formed of a thermal barrier coating material arranged as a plurality of columnar grains extending generally perpendicular to the substrate surface and having grain surfaces, and  
a sintering inhibitor within the columnar grains, the sintering inhibitor being selected from the group consisting of lanthanum oxide, lanthanum chromate, chromium oxide, and yttrium chromate, mixtures thereof, mixtures thereof with aluminum oxide, modifications thereof wherein cobalt or manganese is substituted for chromium, precursors thereof, and reaction products thereof.
2. The article of claim 1, wherein the substrate comprises a nickel-base superalloy.
3. The article of claim 1, wherein the substrate comprises a component of a gas turbine engine.
4. The article of claim 1, wherein the substrate comprises an article selected from the group consisting of a turbine blade, a turbine vane, a combustor fuel nozzle, and a combustor shield.
5. The article of claim 1, wherein the thermal barrier coating system further comprises  
a bond coat disposed between the substrate and the thermal barrier coating.
6. The article of claim 5, wherein the bond coat is selected from the group consisting of a diffusion aluminide and an aluminum-containing overlay coating.
7. The article of claim 5, wherein the bond coat is a platinum aluminide.
8. The article of claim 1, wherein the thermal barrier coating comprises

yttria-stabilized zirconia.

9. The article of claim 1, wherein the sintering inhibitor is concentrated at the grain surfaces.

10. The article of claim 1, wherein the sintering inhibitor is of substantially constant concentration throughout the thermal barrier coating.

11. An article protected by a thermal barrier coating system, comprising:  
a substrate having a substrate surface; and  
a thermal barrier coating system overlying the substrate, the thermal barrier coating system comprising

a thermal barrier coating formed of a thermal barrier coating material arranged as a plurality of columnar grains extending generally perpendicular to the substrate surface and having grain surfaces, and

a form of a sintering inhibitor within the columnar grains, the form of the sintering inhibitor being selected from the group consisting of lanthanum oxide, lanthanum chromate, chromium oxide, and yttrium chromate.

12. The article of claim 11, wherein the form of the sintering inhibitor is a member of the group consisting of lanthanum oxide, lanthanum chromate, chromium oxide, and yttrium chromate, and mixtures thereof.

13. The article of claim 11, wherein the form of the sintering inhibitor comprises a mixture of aluminum oxide and at least one of the group consisting of lanthanum oxide, lanthanum chromate, chromium oxide, and yttrium chromate.

14. The article of claim 11, wherein the form of the sintering inhibitor comprises at least one of the group consisting of lanthanum chromate, chromium oxide, and yttrium chromate, modified with cobalt or manganese substituted for at least some of the chromium.

15. The article of claim 11, wherein the form of the sintering inhibitor comprises a precursor of at least one of the group consisting of lanthanum oxide, lanthanum chromate, chromium oxide, and yttrium chromate.

16. The article of claim 11, wherein the form of the sintering inhibitor comprises a reaction product of at least one of the group consisting of lanthanum chromate, chromium oxide, and yttrium chromate.

17. A method for fabricating an article protected by a thermal barrier coating system, comprising the steps of

providing a substrate having a substrate surface; and

applying a thermal barrier coating system overlying the substrate, the thermal barrier coating system comprising

a thermal barrier coating formed of a thermal barrier coating material arranged as a plurality of columnar grains extending generally perpendicular to the substrate surface and having grain surfaces, and

a sintering inhibitor within the columnar grains, the sintering inhibitor being selected from the group consisting of lanthanum oxide, lanthanum chromate, chromium oxide, and yttrium chromate, mixtures thereof, mixtures thereof with aluminum oxide, modifications thereof wherein cobalt or manganese is substituted for chromium, precursors thereof, and reaction products thereof.

18. The method of claim 17, wherein the step of applying includes the steps of  
co-depositing the thermal barrier coating and the sintering inhibitor.

19. The method of claim 17, wherein the step of applying includes the steps of  
depositing the thermal barrier coating, and thereafter  
infiltrating the sintering inhibitor into the thermal barrier coating.

20. The method of claim 19, wherein the step of infiltrating comprises the steps of  
forming a solution containing the sintering inhibitor, and  
contacting the solution to the thermal barrier coating.

21. The method of claim 17, wherein the step of applying a thermal barrier coating system includes the steps of

depositing a bond coat overlying the substrate, and thereafter  
depositing the thermal barrier coating overlying the bond coat.

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